A Study of Small Bowel Tumors

With Special Emphasis on Clinical Aspects

E. J. JOERGENSON, M.D., *Glendale*, and LAUREL A. WEIBEL, M.D., *Los Angeles*

SUMMARY

Ninety-eight patients with 100 different tumors of the small bowel were studied. There were more malignant than benign tumors. Adenocarcinoma was the commonest lesion and the ileum the most frequent anatomical site of all tumors. Except for carcinoid tumors, the lesions were observed more often in male than in female patients. The average age of patients in this series was higher than that reported in most other series. Loss of weight, and abdominal pain were the most constant symptoms. Clinical syndromes of anemia and bleeding, small bowel obstruction, biliary obstruction, perforation with peritonitis, abdominal tumor, melanosis with small bowel polyposis, and cutaneous von Recklinghausen's disease with small bowel neurofibromatosis were encountered either alone or in combination.

In the group operated upon, a resection of the involved segment with end-to-end anastomosis was done when feasible. None of the patients operated upon before 1946 lived as much as five years after operation. The most common causes of death were extension of the primary tumor and metastasis, peritonitis due to perforation, associated bronchopneumonia, and hemorrhage.

THAT tumors may occur in the small intestine is a fact too often ignored. The purposes of this study are to emphasize this fact, to stress the importance of a complete investigation of the patient with digestive complaints, to enter a plea for earlier diagnosis and treatment, and to add to the literature a report on a series of 100 tumors of the small bowel observed in 98 patients during a 13-year period at the Los Angeles County Hospital.

The experience of any one surgeon in diagnosing and treating tumors of the small bowel is limited. As a result the mortality rate in such cases is higher than in cases involving tumors of any other part of the gastrointestinal tract. The low salvage rate, in view of the fact that many of these tumors are slow-growing and metastasize late, is undoubtedly influenced by the long duration of the disease before it is diagnosed and treated. If the cause of a digestive complaint is not determined in a thorough clinical investigation, exploratory laparotomy may be indicated. Exploration should include careful examination of the entire small bowel.

Presented before the Section on General Surgery at the 80th Annual Session of the California Medical Association, Los Angeles, May 13-16, 1951.

REVIEW OF THE LITERATURE

The incidence of malignant tumors of the large bowel is reported as 3.66 per cent of all malignant lesions, and of the small bowel as 0.098 per cent.[21] Willis[24] reported a series of 17 carcinomas of the small bowel and 190 of the large—a ratio of approximately 1:11. In most reported series,[4, 7, 8, 15] it was noted that small-bowel tumors were more often malignant than benign. Spier[22] stated that 3 per cent of all gastrointestinal carcinomas and 60 per cent of intestinal sarcomas occur in the small bowel. After the appendix the small intestine is the most common site of carcinoid tumors.[12] Leiomyomas make up 1 per cent of all gastrointestinal tumors, and hemangiomas 0.3 per cent.[2, 13] One-half of all gastrointestinal lipomas occur in the small intestine.

Cattell[5] declared that although small-bowel tumors are relatively rare, the diagnosis should be considered when examination of the stomach and colon does not reveal a cause for abdominal pain or bleeding. Rouse[20] listed, as indications for special studies, melena or the persistent presence of occult blood in the stools with unexplained anemia, abdominal pain or tenderness, and altered bowel function. X-ray studies done by a skilled radiologist may determine the presence of the lesion in only 25 per cent of cases.[6] A long intestinal tube has been used to locate the site of bleeding and also to collect specimens for cytologic study, with promising results in a few cases.[23, 16] Cattell[5] recommended that if definite diagnosis is impossible by other means, exploratory laparotomy be carried out, with thorough investigation of the small bowel.

The operative mortality rate in small-bowel carcinoma is 44 per cent and the five-year survival rate less than 5 per cent.[9] Similarly, prognosis in lymphosarcoma is poor while in leiomyosarcoma it is fairly good.[10, 19] Carcinoid or argentaffin tumors in the small intestine are reported to metastasize in up to 52 per cent of cases and are usually considered to be of low-grade malignancy.[17] The poor salvage rate is undoubtedly due to the long duration of the disease before treatment is given. Shallow[21] recommended wide segmental resection of all malignant tumors of the small bowel except moderately advanced lesions in the ampullary region of the duodenum; for such lesions he advised radical pan-

creaticoduodenectomy. For benign small-bowel tumors the treatment recommended is that which is indicated by the nature of the complication—intussusception, volvulus, hemorrhage—which leads to the operative diagnosis of the lesion.[3, 19, 18]

ANALYSIS OF DATA

One hundred small-bowel tumors were observed in 98 patients, 62 males and 36 females, during a 13-year period from 1938 through 1950. Ninety of the patients were Caucasian, seven Negro, and one Oriental. Sixty-one of the tumors were malignant and 39 benign. Thirty-four of the malignant tumors were in males and 27 in females—a ratio of approximately 7:5. The majority of benign and malignant tumors occurred in patients in the seventh and eighth decades of life (Chart 1). This may be explained by the fact that many of the benign tumors were only incidental in patients dying of other causes. Furthermore, in a charity hospital the average age of patients is higher than it is in the ordinary private hospital.

Anatomical Location. One carcinoid tumor, one sarcoma, and 19 carcinomas occurred in the duodenum (Table 1); but, except for carcinoma, the greater proportion of malignant lesions were in the ileum. Benign tumors occurred with equal frequency in duodenum and ileum. All sectors of the small intestine were involved in two cases of benign tumor.

Annual Distribution of Cases. Small bowel tumors were recognized with greater frequency both at operation and at autopsy during the last five years, and particularly during the last two years, of the period studied (Chart 2). During the 12 months July 1, 1949, to June 30, 1950, there were 202 patients admitted with a diagnosis of malignant disease of the large bowel and 16 with a diagnosis of malignant lesion of the small bowel, or a ratio of 12.6:1. In this series, the neoplasms were discovered at operation in 34 instances. Autopsies were done in 79 cases, in 15 of which operation had been done.

TABLE 1.—*Anatomical Location of Tumors*

Lesion	Duodenum Supra-Ampullary	Duodenum Peri-Ampullary	Duodenum Infra-Ampullary	Jejunum	Ileum	Through-out	Totals
MALIGNANT		21		11	29		61
Carcinoma	6	11	2	2	7		28
Carcinoid		1		2	9		12
Sarcoma		1		7	13		21
BENIGN		14		9	14	2	39
Adenomatous polyps	6	1	2	3	5		17
Leiomyoma		2		4	3		9
Neurofibroma		2		....	4	1	7
Lipoma		1		....	1		2
Heterotopic pancreas		....		1	....		1
Hamartoma		....		1	....		1
Lymphangiectatic polyp		....		....	1		1
Multiple hemangiomata		....		....	....	1	1

Pathologic Types. The various kinds of tumors observed are listed, in the order of incidence in this series, in Table 2. Since adenocarcinoma was the most common malignant lesion and the adenomatous polyp the most common benign tumor, it is suggested that one may be precursor of the other.

Symptomatology. The average duration of symptoms (Chart 3) in carcinoma was 5½ months, in sarcoma 9½ months, in carcinoid tumor 19 months; and the average for benign tumors was 23 months.

Benign neoplasms of the small intestine rarely cause symptoms except as complications develop. This may largely be true of malignant tumors also.

CHART 1

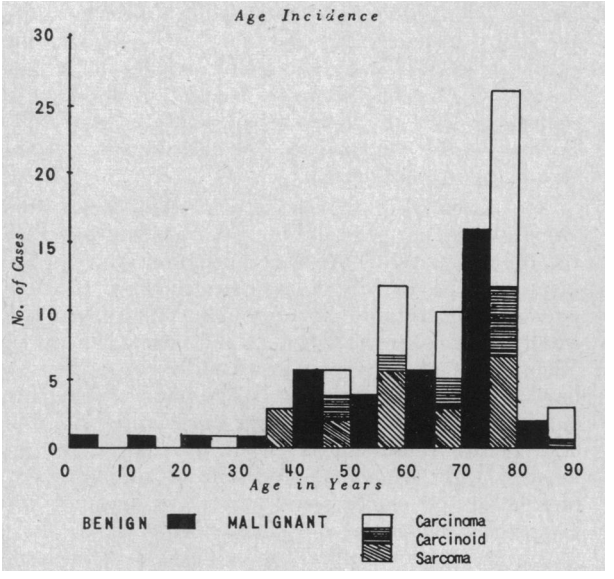

CHART 2

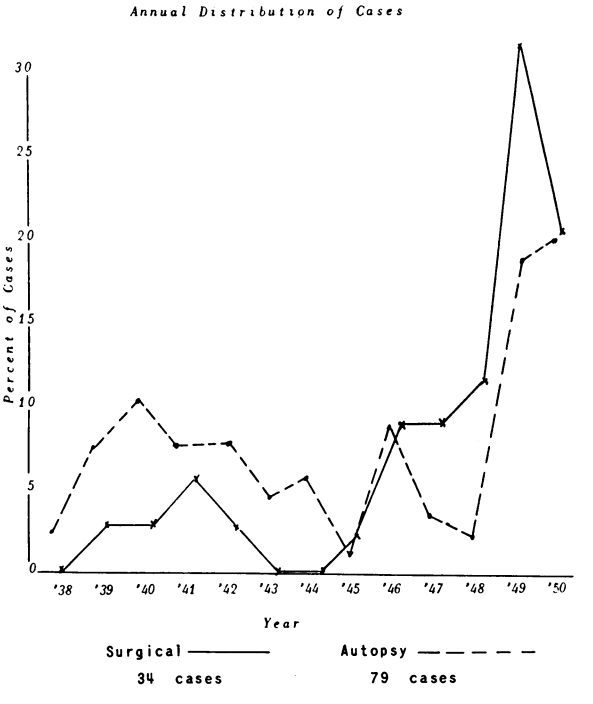

TABLE 2.—*Pathologic Types of Tumors*

Malignant		Benign	
Adenocarcinoma	28	Adenomatous polyps	17
Carcinoid	12	Leiomyoma	9
Lymphosarcoma	10	Neurofiroma	7
Leiomyosarcoma	7	Lipoma	2
Neurofibrosarcoma	3	Hamartoma	1
Melanoma	1	Heterotopic pancreas	1
		Lymphangiectatic polyp	1
		Multiple hemangiomata	1
Totals	61		39

In the present series the most commonly observed individual symptoms were loss of weight, pain, nausea and vomiting, and melena. Loss of appetite due to mechanical interference with the passage of food and the systemic effects of disseminated malignant disease resulted in loss of weight in 40 patients (Table 3). Although pain was a prominent symptom, it differed considerably because of the diversified etiologic factors. Vomiting, observed in 30 instances, might have been expected to occur more frequently, but the liquid content of the small bowel passes through remarkably small openings without producing obstruction.

Bleeding is more often occult in ulcerating mucosal tumors and massive in the cavitating, excavating connective tissue tumors of muscular origin.

Clinical Syndromes. Symptoms (Table 4) may be classified into one or more of the following syndromes: Bleeding with anemia, small-bowel obstruction, biliary obstruction, perforation with peritonitis, abdominal tumor, circumoral pigmentation with small-bowel polyposis, and cutaneous von Recklinghausen's disease with intestinal neurofibromatosis or leiomyomata.

Bleeding or anemia associated with melena, tarry stools, persistent occult blood on a meat-free diet, hematemesis (in three cases), and increasing weakness and fatigue was the commonest syndrome. In many cases, no abnormality was observed in roentgen studies of the large bowel and upper gastrointestinal tract with barium, and not infrequently the patients were considered neurotic.

Obstruction owing to a stenosing lesion or to acute or recurrent intussusception caused by a polypoid tumor, was the next most frequent symptom complex. Patients with symptoms of this order gave a history of variable duration of colicky abdominal pain, vague discomfort (often interpreted as "gas"), a change in bowel habit (usually constipation), and recurrent nausea and vomiting. It is significant that vomiting occurred in several cases without nausea.

Except for two cases, the syndrome of biliary obstruction occurred in association with lesions in the periampullary region of the duodenum. Bleeding with jaundice and pruritus, vague postprandial discomfort in the right upper quadrant of the abdomen and in the epigastrium, a palpable gallbladder, and occasionally nausea and vomiting were characteristic observations. In some cases the jaundice was intermittent but in the majority it was progressive.

Symptoms of peritonitis—severe continuous abdominal pain, rebound tenderness with rigidity, fever, and leukocytosis—may be the only manifestation of a perforating neoplasm in the small bowel. There may be associated symptoms of small-bowel obstruction. It should be remembered that elderly patients at times respond abnormally to peritonitis; in the present series a few had little or no abdominal pain and no leukocytic response to the disease.

An abdominal tumor was the primary symptom in two patients who complained of abdominal fullness and of a palpable "lump." There were a number of patients with other primary symptoms who also had a palpable tumor.

Less common, perhaps, but of interest are the last two syndromes listed in Table 4. In one patient in the present series the condition observed was like that described by Jeghers[14] — intestinal polyposis with melanotic spots on the oral mucosa, lips, and digits. This patient was twice operated upon for obstruction and a jejunal adenoma was removed on each occasion. Five patients with cutaneous von

CHART 3

Duration of Symptoms

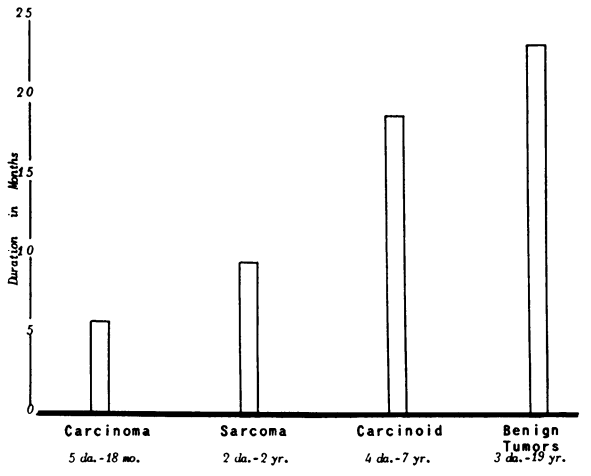

TABLE 3.—*Symptoms of Small Bowel Tumors*

Symptoms	Carcinoma	Carcinoid	Sarcoma	Benign Tumors	Totals
Weight loss	19	6	11	4	40
Pain	13	6	11	5	35
Nausea	7	2	7	2	18
Vomiting	12	5	8	5	30
Anorexia	5	1	4	1	11
Jaundice	9	....	1	1	11
Weakness	6	....	3	1	10
Constipation	5	....	6	2	13
Diarrhea	4	2	2	2	10
Melena	7	3	5	3	18
Hematemesis	2	2	....	....	4
Fever	2	3	1	1	7
Gas or Bloating	4	4	4	....	12
Hiccoughs	....	1	1	....	2
Pruritus	2	....	....	....	2

TABLE 4.—*Clinical Syndromes*

Bleeding with anemia (in 38 cases): Melena, occult blood or tarry stools, hematemesis, weakness and fatigue
Small bowel obstruction (in 31 cases): Incomplete and recurrent pain, nausea and vomiting, "gas," constipation
Biliary obstruction (in 14 cases): Jaundice, pruritus, nausea and vomiting, vague right upper abdominal pain, palpable gallbladder
Perforation with peritonitis (in 15 cases): Constant pain, tenderness with rebound rigidity, fever, leukocytosis
Abdominal tumor (in 3 cases): Sensation of abdominal fullness or heaviness with or without digestive complaints
Melanosis with small-bowel polyposis (in 1 case)
Cutaneous von Recklinghausen's disease with intestinal neurofibromatosis (in 5 cases)

Recklinghausen's disease had similar lesions of the small bowel which were multiple in four cases. It is also noteworthy that in two cases of benign leiomyomata and in two of leiomyosarcomata there was an associated diagnosis of fibromyomata uteri.

DIAGNOSIS

In 16 per cent of the 62 cases in which symptoms were present, the lesion was correctly diagnosed; in 19 per cent the diagnosis was obstruction of the bowel, and in 8 per cent gastrointestinal malignant disease was diagnosed but the site of the lesion was not determined. In the remaining 58 per cent the diagnoses were incorrect. It should be mentioned that since many of the patients entered the hospital critically ill, an adequate study could not be done. Diagnostic measures included examination of stools for occult blood and parasites, upper and lower gastrointestinal barium studies, and small-bowel progress meals, proctosigmoidoscopy, gastroscopy, peritoneoscopy, and the use of a small-bowel tube to determine the site of obstruction. No one of these procedures was diagnostic in more than three cases, but it is only through the use of these studies in conjunction with a careful history and physical examination that diagnostic accuracy can be improved. As stressed before, if diagnosis cannot be confirmed otherwise, operation is indicated as a diagnostic as well as a therapeutic procedure.

TREATMENT

Thirty-four patients in this series were operated upon and malignant tumors were found in 78 per cent of them. En bloc resection with end-to-end anastomosis was done in 15 cases of malignant growth and five cases of benign lesions of the jejunum and ileum. Of the four patients with ampullary lesions of the duodenum, one was treated with local excision and three with resection of the Whipple type. Four patients were treated with side-tracking measures for palliation, and in three cases only exploration and biopsy were carried out. There were no five-year survivals among the eight patients operated upon before 1946.

Causes of Death. Thirty-four patients were operated upon, seven for benign and 27 for malignant lesions. Four of those with benign lesions are alive, while three of those with malignant disease had lived, at the time of this report, an average period of 21 2/3 months after operation. There were 13 postoperative deaths in the group with malignant lesion, while 11 survived the first two-week period for an average of 15 months.

The most common cause of death (Table 5) was recurrent disease with metastasis. Next in order were postoperative bronchopneumonia, peritonitis secondary to perforation, pulmonary embolism, postoperative bleeding, evisceration, infarction of bowel attributable to interference with blood supply. In three cases death was caused by unrelated disease. Only one patient with a benign tumor died as a result of direct complications of the tumor.

Autopsy was done in 36 cases of malignant tumors and 31 cases of benign lesion. A small-bowel tumor was an incidental finding in nine of the former and 27 of the latter group. The majority of patients with malignant tumor died as a result of the local disease and metastasis (Table 6). Peritonitis due to perforation, intercurrent bronchopneumonia, bowel obstruction, and massive hemorrhage, in order of frequency, were other causes of death.

DISCUSSION

Tumors of the small intestine are not rare, although compared with tumors of the lung, stomach, and colon they are not common. This was emphasized in this series in which the incidence of malignant tumors of the small intestine was one-twelfth the incidence of such lesions in the large intestine. Further, such tumors as sarcoma and lipomas more often involve the small intestine than any other part of the gastrointestinal tract.

TABLE 5.—*Causes of Death in Cases in Which Operation Was Carried Out*

	Malignant	Benign
Recurrent disease with metastasis	6	....
Postoperative bronchopneumonia	5	....
Peritonitis due to perforation	5	1
Pulmonary embolism	2	....
Postoperative bleeding	1	....
Small bowel infarction due to interference with blood supply	1	....
Unrelated disease	3	2
Totals	24	3

TABLE 6.—*Causes of Death (Autopsy Cases)*

	Malignant	Benign
Local disease with metastasis	14	....
Intercurrent bronchopneumonia	2	....
Peritonitis due to perforation	9	1
Bowel obstruction	1	1
Massive hemorrhage	1	1
Unrelated disease	9	27
Totals	36	30

This study indicates that where there is greater awareness of these lesions, they are diagnosed with greater frequency. Abdominal exploration should include a systematic study of the entire small bowel; even then, soft polyps may be overlooked.

In cases of malignant disease of the small intestine, the salvage rate in this series was exceedingly small. This is explained in part by the duration of symptoms prior to the establishment of diagnosis and treatment. Durations of symptoms of five and one-half months for carcinoma and nine and one-half months for sarcoma and 19 months for carcinoid tumors prior to treatment are dangerously long.

Many factors are responsible for the delay. Physicians are accountable for some of it. Symptomatic treatment of dyspepsia with incomplete diagnostic study is a poor approach to the problem of carcinoma of the small intestine. In approximately one-third of the cases in this series, treatment was begun only after the precipitous onset of major complications. It is obvious, then, that the earlier operation is done, the greater the opportunity to deal with uncomplicated local disease, and the higher the salvage.

Since many of the patients were admitted in a condition necessitating emergency operation, any attempt at complete diagnosis was impossible. On the other hand, in cases in which the patient has symptoms of chronic dyspepsia or recurring cramping abdominal pain, yet the routine x-ray studies of the stomach, gallbladder, and colon do not supply a definite clue, the small bowel must be examined carefully by x-ray. If any doubtful lesion is observed, it should be investigated further with selective x-ray and cytologic studies, utilizing the long intestinal tube.

632 North Brand Boulevard.

REFERENCES

1. Aird, I.: A Companion in Surgical Studies, E. & S. Livingstone, Ltd., p. 701, 1949.

2. Bauer, F.: Leiomyoma of the ileum: report of a case, Proc. Staff Mayo Clinic, 22:99, March 5, 1947.

3. Bosworth, B. M., and Stein, H. D.: Intussusception in adults—case due to aberrant pancreas, Am. J. Surg., 74:801, Dec. 1947.

4. Botsford, T. W., and Seibel, R. E.: Benign and malignant tumors of the small intestine, New Eng. J. M., 236:683, May 8, 1947.

5. Cattell, R. B., and Colcock, B. P.: Tumors of the small intestine, Surg. Clin. N. Am., 27:646, June 1947.

6. Connolly, E. A., and Lempha, A. W.: Jejunal malignancy—report of two cases, Surg., 21:901, June 1947.

7. Delano, P.: Tumors of the small intestine—report of two cases of carcinoma of the jejunum, Am. J. Roentg., 59:685, May 1948.

8. Eckel, J. H.: Primary tumors of the jejunum and ileum, Surg., 23:467, March 1948.

9. Emmett, J. M., and Dreyfuse, M. L.: Malignant tumors of the small bowel, Ann. Surg., 123:859, May 1946.

10. Galluccio, A. C.: Lymphoblastoma of the terminal ileum, N. Y. State J. M., 46:2049, Sept. 15, 1946.

11. Grausman, R. I., and Rogers, S. S.: Surgery of ileal tumors, Am. J. Surg., 77:387, March 1949.

12. Grimes, O. F., and Bell, H. G.: Carcinoid tumors of the intestine, Surg., Gynec. and Obst., 88:317, March 1949.

13. Hansen, P. S.: Hemangioma of the small intestine—review of the literature and report of three cases, Am. J. Clin. Path., 18:14-42, Jan. 1948.

14. Jeghers, H., McKussick, V. A., and Katz, K.: Generalized intestinal polyposis and melanin spots on the oral mucosa, lips, and digits, New Eng. J. M., 241:993-1005, 1031-1036, Dec. 22 and 29, 1949.

15. Jenkinson, E. L., Pfisterer, W. H., and Seitz, E. R.: Primary tumors of the small intestine, Radiology, 55:12-19, July 1950.

16. Mackenzie, L. L., and Miller, H. B.: Primary carcinoma of the duodenum—report of one case, Gastroenterology, 12:302, Feb. 1949.

17. McLaughlin, E. F., Ciccone, E. F., and Manning, V. R., Jr.: Carcinoid tumor of the small intestine, Am. J. Surg., 80:64, July 1950.

18. Ravitch, M. M.: Polypoid adenomatosis of the entire gastrointestinal tract, Ann. Surg., 128:283, Aug. 1948.

19. Roth, D., and Farinocci, Chas. J.: Jejunal leiomyosarcoma in a newborn, Cancer, 3:1039, Nov. 1950.

20. Rouse, M. O., and Reynolds, W. S.: Tumors of the small intestine, Southern Med. J., 43:247, March 1950.

21. Shallow, T. A., Wagner, F. B., and Mange, W. B.: Primary carcinoma of infrapapillary portion of the duodenum, Surg., 27:348, March 1950.

22. Spier, Jack, and Wood, E. C.: Metastatic melanosarcoma involving the intestine and brain, New Eng. J. M., 236:824, May 29, 1947.

23. Stewart, J. B.: Tumor of the small intestine—Miller-Abbott tube determines site of massive hemorrhage. Ann. Surg., 128:299, Aug. 1948.

24. Willis, R. A.: Pathology of Tumors, C. V. Mosby Co., pp. 412-413, 1948.